

Distribution of Charge Transfer at the LaAlO₃/SrTiO₃ Interface Revealed by Hard X-ray Photoelectron

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We investigated the charge distribution at *n*-type LaAlO₃/SrTiO₃ interface by using hard x-ray photoelectron spectroscopy (HAXPES) under grazing incidence. When the x-ray incidence angle crosses the critical angle, evanescent waves propagating along the interface collapse and the transmission of x-ray increases abruptly; under such a condition, the intensity ratio between photoelectron yields from Ti³⁺ and Ti⁴⁺ is diminished strongly. The photoemission measurements excited by x-rays of various incidence angles near the critical angles give rise to information about the distribution of Ti³⁺. Our HAXPES results indicate that the interfacial charge reconstruction of Ti³⁺ in *n*-type LaAlO₃/SrTiO₃ extends from the interface into SrTiO₃ with a depth about 48 Å and the total charge of transfer is estimated to be ~ 0.25 electron per 2D unit cell.